



**DAVIDS**  
ENGINEERING, INC

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February 24, 2012

Mr. Manucher Alemi  
Chief, Water Use and Efficiency Branch  
Department of Water Resources  
901 P Street  
Sacramento, California 95814

**SUBJECT: Comments on February 3, 2012 Draft of Water Use Efficiency Quantification Methodology Report**

Dear Manucher:

As members of the Agricultural Stakeholder Committee and A1 Subcommittee, Gary Kienlen, Roger Reynolds and I respectfully submit our comments on the February 3 draft of the Department's efficiency methodology report. Our comments are primarily technical in nature and are presented in the attached list.

Please note, this listing is not intended as an exhaustive list of all technical comments. In our opinion, even if the technical issues we raise are addressed, the report needs significant revision to make it clear, readable and useful for the intended purpose of informing legislators. In its current form, we are deeply concerned that the report would do more to confuse legislators, especially ones not familiar with agricultural water use, rather than to inform them.

We remain committed to the process of developing a methodology for quantifying agricultural water use efficiency that both complies with the legislative directive and, more importantly, in our view, contributes positively to advancing agricultural water management in California.

Please feel free to contact any of us should you have any comments or questions.

Sincerely,

Grant G. Davids, PE

cc: Gary Kienlen, PE  
Roger Reynolds, PE

# Technical Comments on the February 3, 2012 Draft of the Report Entitled “A Methodology for Quantifying the Efficiency of Agricultural Water Use”

Prepared by  
Grant Davids, PE  
Gary Kienlen, PE  
Roger Reynolds, PE

## Section 1 – Introduction

- 1) Page 3, Section 1.2, 1st para. The distinction between methods and indicators and how they are treated in the report is not sufficiently clear. First time readers are likely to be confused without further explanation.

## Section 2 – Water Use and Water Use Efficiency in Agriculture

- 2) Page 5, 3<sup>rd</sup> para, pertaining to sentence: “*They may operate these water deliveries through open channels, lined or earthen canals, or pipes and flow control structures and water measurement devices.*” (emphasis added) Open channels and lined or earthen canals denote the same thing.
- 3) Page 5, 3<sup>rd</sup> para, last sentence. The phrase “terminal points” should be defined since it is not commonly used. In fact, the phrase is used only once more in the document; consider eliminating.
- 4) Page 6, 1<sup>st</sup> para, pertaining to the following sentences: “*Water conservation refers to reducing the amount of water use, and water use efficiency refers to reducing the input of water for achieving an output. For agriculture, water use efficiency is minimizing the amount of water used relative to crop water requirements.*” It is incorrect to say that water use efficiency denotes reducing or minimizing water use. Rather, it should be made clear that implementing measures to *increase* efficiency is a means of reducing water diverted or delivered to meet crop water requirements of other beneficial uses.
- 5) Page 6, 2<sup>nd</sup> para, second sentence. Suggest striking “*in the basin from which it was extracted*” because water, once consumed, is not available for reuse anywhere.
- 6) Page 7, 1<sup>st</sup> para, 1<sup>st</sup> sentence. “...a water balance approach...” is mentioned but there is no explanation of what a water balance is, how it can be used to quantify efficiency and why it is a useful technique. Discussion should be deleted or expanded or at least reference made to additional detail in section 3.
- 7) Page 7, 1<sup>st</sup> para, Suggest striking the next to last 2 sentences. Reference is made to evaluating “*the efficiency of beneficial uses.*” It is not explained how this is to be accomplished nor how it relates to quantifying the efficiency of agricultural water use.
- 8) Page 7, last para, discussion of boundaries should include the importance of defining temporal

boundaries as well as the physical boundaries discussed.

- 9) Page 8, 1<sup>st</sup> full para. It is stated that it is important to recognize boundary (spatial scale) mismatches. The mismatches are described, but it is not explained why this recognition is important.

- 10) Page 8, 2<sup>nd</sup> full para, regarding the following sentence: *“A water balance is a representation of all sources and dispositions of water into, within, and out of a defined boundary over a defined period of time.”* Most readers, especially ones unfamiliar with water balances, are likely to imagine a 2-D area, such as would be delineated by a boundary line on a map. In fact, water balances are prepared for 3-D volumes, so that changes in storage within the volume can be tracked. The report would benefit from a separate section dedicated to and illustrating how agricultural water balances are prepared and used, or appropriate technical references provided.

- 11) Page 8, last para. The discussion should be expanded to explain the relationships between efficiencies at different scales. It is simply stated that small scale efficiency cannot be aggregated to arrive at larger scale efficiency, but it is not explained *why*.

## Section 3 – Methodology for Quantifying the Efficiency of Agricultural Water Use

- 12) Page 10, last para including Figure 3-1:

- a. The water balance domain (or “accounting center”) is not clear. Is it the box or the box plus the dashed line arrows below the box?
- b. Agronomic needs (AN) and Non ag uses are described as outputs from the water balance, but are illustrated as internal elements or processes.
- c. The arrows crossing water supplier boundaries are not defined.
- d. Most regions also contain agricultural areas relying solely on groundwater. Should these areas also be depicted in the water balance domain?
- e. Based on the illustration, it appears that environmental needs are consumptive, but this is not clear. Same question for the Refuge flow path.
- f. Does the water balance domain contain rivers, streams, sloughs and drains that are typically interspersed with irrigated lands, or is the balance just with respect to irrigated lands?

- 13) Page 12, last para including Figure 3-2:

- a. The water balance domains (or “accounting centers”) are not clear. Are the storage, conveyance and field irrigation boxes each accounting centers or are they one accounting center in aggregate?
- b. What features do the dashed line arrows below the boxes represent, and are they within or outside of the water balance domain?
- c. Short-term regulating storage within a supplier’s conveyance and distribution system is usually depicted as part of the system, not separately (although it could be if data is available to define its inflows and outflows).

- 14) Page 14, last para including Figure 3-3:

- a. The water balance domain (or “accounting center”) is not clear. Is it just the irrigated field? How does storage relate to the water balance?

- b. What comprises the total water supply? (If  $TWS = SW + GW$ , suggest showing each source separately, with GW originating from below the horizontal dashed line (which, presumably, delineates the groundwater system).
  - c. Illustration does not indicate how applied water relates to the total water supply.
- 15) Page 16, last para, 1<sup>st</sup> sentence. It is not explained why the methods cannot be viewed independently. Further, if this statement is true, then it must be explained how the methods are viewed together.
- 16) Page 16, Section Title 3.2 Water Use Efficiency Methods. This sections describes Quantification Methods not Water Use Efficiency Methods.
- 17) Page 17 and 18, many of the bullets contain long descriptions of terms which have been defined more concisely in other documents including the CA Water Plan.
- 18) Page 17, 2<sup>nd</sup> bullet, concerning effective precipitation, Pe. Reference is made to California's Model Landscape Ordinance as one of the "many methods" for estimating Pe. This method is intended for use in establishing a Maximum Applied Water Allowance for urban landscape areas and simply equates Pe to 25% of annual precipitation, with no technical basis for the 25% provided in the model ordinance. There is no evidence that this method is appropriate for use in estimating agricultural applied water demands. Therefore it should not be used or offered as an example.
- 19) Page 18, 1<sup>st</sup> bullet, concerning applied water. Applied water (AW) is discussed with respect to four spatial scales, differentiated by how AW is measured, but it is not clear what AW represents, conceptually, at the different scales. Is AW the amount of water applied to fields, so that as the scale increases AW is represented by the aggregation of field AW? Or, is AW the water supplied into the water balance domain for agricultural use, in which case the term "applied" becomes a misnomer?
- 20) Page 18, last bullet, concerning leaching requirement. The definition of leaching requirement (LR) is incorrect and inconsistent with other published, accepted LR estimating methods. Furthermore, the recommended calculation results in a dimensionless ratio, not a water requirement. (See FAO Irrigation and Drainage Paper 29 Rev.1.)
- 21) Page 20, last bullet, unsure of the need and purpose for describing "distribution system" since it is not a term included in the DF equation.

## Section 4 – Indicators of Irrigation System Performance and Crop Productivity

- 22) Page 23, 4.2 Crop Productivity, last sentence. The following statement is made "These indicators should not be used to draw firm conclusions about which crops or regions are using water in more economically efficient ways." The Indicators should be included in an Appendix to the Report. And yet, no reasons are provided at this point in the text as to why this should not be done. The information provided on the next page summarizing the factors involved with

crop production should be listed when the statement is made to emphasize why these indicators should not be used.

- 23) Page 25, regarding the 2<sup>nd</sup> & 3<sup>rd</sup> bullets. If the discussion relates only to possible approaches which require "... extensive data needs and complexity of analysis ..." then for a better understanding by the readers it is suggested they be deleted.

## Section 5 – Recommended Implementation Plan

- 24) Section Title 3.2 Water Use Efficiency Methods. Same comment as Section 3.2, this sections describes quantification methods NOT efficiency methods.
- 25) Page 31, 2<sup>nd</sup> and 3<sup>rd</sup> para including Table 5-1, identifies options DWR's recommended method is unclear or not stated. This is important in developing cost estimates later in this section.
- 26) Page 32, Section 5.2.1.3 Data Collection and Reporting for the regional scale. The comment is made "*DWR would need the water suppliers values of AW, AN, EN, RF and DU...*". Water suppliers do not keep track of any DU (Distribution Uniformity) tests performed for landowners and/or the specific AN (Agronomic Needs) of the water users.
- 27) Page 33, 2<sup>nd</sup> full para under Section 5.2.2.1, it is inappropriate to require water suppliers to calculate or report DU data. WC 10608.48 requires water suppliers only to provide for the availability of water management services to water users such as on-farm irrigation and drainage system evaluations. There is no requirement for the water users to use the service or to report the results to the water supplier.(WC 10608.48(c)(12)(A)-(D). Same comment concerning water supplier reporting of DU applies throughout the Draft Report.
- 28) Page 34, Table 5-2. The intro on page 33 states the table "*provides a summary of sources and of data ... and identifies options and needed improvements.*" The Table titles the last column *Notes*, and does not clearly identify they are options or needed improvements. Under the column *Source or options* for it should state that estimates by professionals are acceptable.
- 29) Page 36, 1<sup>st</sup> bullet under Phase 1, suggest striking statement that "[s]uppliers would have relatively good existing data..." as it is ambiguous and presumptuous.
- 30) Page 36, Schedule of Implementation for water suppliers. The sequential Phasing steps indicate there is intended to be an ongoing review and hopefully an improvement in available data for calculation of the methods. The report does not clearly define how this process would occur. There are no off ramps included for adapted management of the process to allow for revisions or changes to the implementation process or the proposed methods.
- 31) Page 38, Table 5-3, table is describing data sources and options for quantifying the efficiency of ag water use. DU is defined as an indicator and does not belong in this table.
- 32) Page 45, 1<sup>st</sup> para below bullets, describes current costs for 4-6 counties. It is unclear what the estimated cost is to implement the proposed methodology statewide.

- 33) Page 46, 4<sup>th</sup> para, 6<sup>th</sup> sentence, states *“the initial cost of installing a device is estimated to be \$24 per acre and annual ongoing cost of \$8 per acre.”* These costs are low and do not take into account the useful life of the device.
- 34) Page 48, Program 2 – Alternative Field Measurement. The reference to IID’s costs is inappropriate and should be deleted. 1) IID is exempt and 2) its infrastructure is more conducive to installation of devices due to years and years and \$100,000’s if not millions of dollars of improvements. Many of the water suppliers utilize earthen canals which may need significant improvement compared to IID.
- 35) Page 49, Table 5-6, implementation costs are unclear. Are Regional costs initial or annual. No costs shown for other levels and who would be responsible. Under Suppliers it should be noted that just because certain actions may be required it does not mean there are no associated costs.

## **Appendix C – Calculation Examples of Water Use Efficiency Methods and Indicators**

- 36) Section C-1, Tables C-1 through C-4 – Use of options based on made up or imaginary situations are confusing. Also raises questions as to what is the method being proposed by DWR.
- 37) Section C-2, pages 75-77 – calculation examples of productivity indicators should be stricken. “Options” in Table C-5 indicate major discrepancy in data crop data. Crop Value data in Table C-6 is from different sources. Fresno County data is 2010 County Ag Report while data for Colusa County is interpolated from prior years and appears to be incomplete.

## **Appendix D – Parameter Descriptions and Calculations**

- 38) Suggest Parameter Descriptions be compared with those from other documents, especially Bulletin 160 for consistency.